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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/516,300

12/09/2004

Gino Palumbo

BROO300

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EXAMINER

LEADER, WILLIAM T

ART UNIT

PAPER NUMBER

1795

MAIL DATE

DELIVERY MODE

08/18/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/516,300	Applicant(s) PALUMBO ET AL.	
	Examiner WILLIAM T. LEADER	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 July 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 10-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 10-33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 1, 2009, has been entered.
2. The amendment filed on July 1, 2009, is deemed to have overcome the rejection under 25 U.S.C. 112, first paragraph.
3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

4. Claims 1-8, 10-12, 15, 17, 27-31 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Erb et al (US 5,433,797) in view of the Lowenheim text *Electroplating* and additionally in view of Biberbach et al (US 3,929,595) and Gonzalez et al (6,743,346) for the reasons of record.

5. Claims 16, 18-25 and 32 rejected under 35 U.S.C. 103(a) as being unpatentable over Erb et al (US 5,433,797) in view of the Lowenheim text *Electroplating* and additionally in view of Biberbach et al (US 3,929,595) and Gonzalez et al (6,743,346) as applied to claims 1-8, 10-12, 15, 17, 27-31 and 33 above, and further in view of the admitted prior art for the reasons of record.

6. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Erb et al (US 5,433,797) in view of the Lowenheim text *Electroplating* and additionally in view of Biberbach et al (US 3,929,595) and Gonzalez et al (6,743,346) as applied to claims 1-8, 10-12, 15, 17, 27-31 and 33 above, and further in view of Uzoh et al (US 7,378,004) for the reasons of record.

7. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Erb et al (US 5,433,797) in view of the Lowenheim text *Electroplating* and additionally in view of Biberbach et al (US 3,929,595), Gonzalez et al (6,743,346) and the admitted prior art as applied to claims 16, 18-25 and 32 above, and further of Hutkin (US 4,088,544) for the reasons of record.

Response to Amendment

8. The declaration under 37 CFR 1.132 filed July 1, 2009, is insufficient to overcome the rejection of claims for the reasons set forth in the last Office action. In paragraph 7 of the declaration it is noted that Erb (US patent 5,433,797) has been applied in rejecting the claims of

the instant application, and it is stated that the patent does not mention mixing or agitation. It is acknowledged that in example 7 of the Erb patent continuous stirring (0-500 rpm) may be present. Declarant Erb states that the purpose of this stirring was to remove concentration gradients and temperature gradients in the electroplating bath, not to control microstructure grain size of an electrodeposit so it is nanocrystalline. In paragraph 12 of the previous office action, the dictionary definition of "agitate" was given as "to move to and fro" or "to shake or move briskly." Based on this dictionary definition, even if the movement of the electrolyte in Erb is considered to be for the purpose of mixing the electrolyte to remove concentration and temperature gradients, it falls within the accepted meaning of "agitate" since a stirrer spinning at 500 rpm would be expected to create brisk movement. Applicant's specification states that in the process of the present invention the electrolyte preferably may be agitated by means or pumps or stirrers. See page 6, lines 6-9. The electrolyte movement produced by stirring in example 7 of the Erb patent is considered to be the same type of electrolyte movement produced by the use of a stirrer in applicant's process, even if the movement was used for a different purpose.

9. In paragraph 8 of the declaration it is stated that continuous stirring mentioned in example 7 is a different property from agitation rate normalized to electrode area. It is the position of the Examiner that the agitation produced by the stirring in Erb and the agitation produced by the use of a stirrer in applicant's process are the same property. Agitation rate normalized to electrode area is considered to be a way of expressing the *amount* of agitation. In Erb, the amount of electrolyte movement is suggested by the rpm of the stirrer rather than as a relationship to electrode area. Just because a process parameter such as agitation is expressed in

a different manner, it does not follow that the parameters itself is different. In paragraph 8 of the declaration it is additionally stated that the stirring in example 7 of Erb does not constitute a recognition that electrolyte flow must be scaled to electrode size as a parameter for controlling microstructure grain size in an electrodeposit. The Examiner concurs that Erb does not set forth a correlation between agitation rate and electrodeposit microstructure. However, it is the Examiner's position that Erb teaches performing the same operative process steps, i.e., agitating the electrolyte, even if for a different reason.

10. In the declaration applicant has addressed the Erb reference alone. It is noted that the claims were rejected over the combination of Erb with Lowenheim, Biberbach et al and Gonzalez et al.

Response to Arguments

11. Applicant's arguments have been carefully considered but are not deemed to be persuasive. At page 10 of the Remarks, applicant states that the previous office action seems to take the position that the stirring in Erb and the convective movement of Lowenheim are the same as agitation rate normalized to electrode area. The Examiner takes the position that the agitation of Lowenheim, Biberbach et al and Gonzalez et al is qualitatively the same as the agitation disclosed by applicant. As noted above, at page 6, lines 6-9 of applicant's specification (paragraph [0026] of the Pre Grant Publication of the application), it is taught that the electrolyte may be agitated by means of pumps or stirrers. Lowenheim teaches that the electrolyte may be stirred or pumped. See page 139. Thus, Lowenheim teaches agitating the electrolyte in the same

way that applicant agitates the solution. As noted in paragraph 8 above, the Erb patent discloses stirring. Thus, Erb also teaches moving the electrolyte in the same way as applicant. Again, as noted above, agitation rate normalized to electrode area is considered to pertain to the *amount* of agitation. Applicant appears to use the terms circulation and agitation synonymously. See page 5, lines 20-21 of the specification which refer to “Electrolyte solution circulation/agitation rates” (paragraph [0021] of the Pre Grant Publication). In applicant’s example 1 at page 12, line 10 of the specification, the electrolyte circulation rate is given as “vigorous agitation”. At column 7, lines 40-41 of Gonzalez et al the agitation is described as “moderate to very vigorous”.

Consequently, there appears to be no difference in the amount of actual agitation used by applicant and that taught by the prior art.

12. At the bottom of page 10 of the Remarks, applicant argues that the stirring of Erb and Lowenheim deals with the uniformity of the bulk electrolyte, whereas the agitation rate normalized for electrode area concerns itself with the electrolyte flow in close proximity to the electrode surface and scaling to the size of the electrode surface. Lowenheim is also concerned with the electrolyte flow in close proximity to the electrode surface. Lowenheim teaches that as metal is deposited upon a cathode, the solution in its immediate neighborhood is depleted in metal ions. If plating is to continue, these ions must be replenished. There are three ways in which this is accomplished. Least important of these three ways is ionic migration. Much more important is convection which involves the movement of substantial quantities of the solution relative to the electrodes. The electrode may move, the solution may move, or both. Convection may be produced by agitating the cathodes, or the solution may be stirred or it may be pumped.

See page 139. Thus, Lowenheim provides clear motivation for producing solution movement in close proximity to the electrode surface by stirring or pumping, i.e. agitation.

13. At page 11 of the Remarks, applicant argues that both Erb and Lowenheim teach mixing of the electrolyte bath so that it is or remains of uniform composition and temperatures, while on the other hand, the agitation/flow rate normalized to electrode area is to provide in concert with high deposition rate the occurrence of grain refinement. This argument is not convincing. As noted above, Lowenheim also teaches agitation to replenish metal ions in the immediate neighborhood of the cathode electrode on which deposition takes place. Gonzalez et al teach that a high agitation rate is often necessary to obtain high productivities (column 6, lines 52-54). Biberbach et al teach that deposition rate depends on the current density and agitation of the bath (column 3, lines 8-12). So the references clearly suggest the use of agitation for additional reasons in addition to creating uniform composition and temperature, including replenishment of metal ions in the immediate neighborhood of the workpiece and allowing higher deposition rates. Applicant argues that the in the claimed process of electroplating agitation is employed with a high deposition rate for the purpose of grain refinement. While it may be correct that applicant's motivation for using agitation is different than the motivation disclosed by the references, this argument is not persuasive of patentability because it is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by applicant. See MPEP 2144 IV.

14. At page 12 of the Remarks, applicant refers to an article by Qiao et al. Applicant states that Qiao includes a bulk electrolyte tank where electrolyte is mixed and heated, and that this is

where the Erb and Lowenheim mixing takes place. On the other hand, electroplating takes place in (4) where electrolyte is pumped at high speeds across the cathode, and that this is surface electrode flow and is equivalent to the claimed electrode area normalized agitation rate. This argument is not convincing. It is first noted that there is no limitation in the claims that electrolyte is pumped across the surface of the cathode at high speed. Rather, claim 1 recites a step of agitating, and specifies an agitation rate which is based on the size of the cathode. However, even if the claims recited flow across the surface of the cathode, this would not distinguish from the teaching of Lowenheim which, as explained above, teaches movement of the electrolyte in the *immediate neighborhood* of the cathode to replenish the electrolyte. This movement is the same as the movement of electrolyte in tank (4) of Qiao. Additionally, Erb shows and describes only a single tank which contains the electrolyte, plating cell (1). There is no separate bulk electrolyte tank.

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Pages 17-21 of the Lowenheim text *Modern Electroplating* provides a somewhat more detailed description of Mass Transport and the role of agitation in decreasing the thickness of the diffusion layer adjacent to the cathode surface.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILLIAM T. LEADER whose telephone number is (571) 272-

1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/William Leader/
August 11, 2009

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795